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it contains a fresh water fauna consisting of gastropods and Unios, and in some instances species common to two or more localities.

The Colorado formation is represented by a characteristic fauna, consisting for the most part of Inocerami. The Montana formation is recognized, but its divisions are not easily differentiated. It seems probable that only the lower part of the Montana is represented.

In all, thirteen new species are figured and described. The majority of these belong to the Jurassic.

W. N. LOGAN.

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*The Glacial Gravels of Maine and their Associated Deposits.* By GEORGE H. STONE. Monograph XXXIV, U. S. Geological Survey, 499 pp., 52 plates, 36 figures. Washington, 1899.

The enthusiastic pursuit of kames and eskers through the forests of Maine without official aid, in the later seventies, by Professor Stone, led to his engagement for a monographic study of all the glacial gravels of that phenomenally rich region by the U. S. Geological Survey. The results appear in this monograph. It would be an error, however, to overlook the second half of the title, for much attention is given to the formations associated with the glacial gravels, and tributary to their formation, so that the volume falls little short of being a monograph on the Pleistocene deposits of Maine.

So far as present knowledge extends, two regions surpass all others in the richness of their esker or osar phenomena—Maine on this continent, and Sweden on the eastern. This singular distribution is perhaps due to a critical relation between the general slope of the land surface in these regions and the minimum gradient at which glacier ice flows effectively, so that a condition of approximate stagnation was assumed in the closing stages of glaciation and the internal drainage lines of the ice sheet were permitted to develop with exceptional facility. However that may be, Maine is certain to be the classic field for esker studies in this country.

The plan of the volume embraces a preliminary discussion in which the fundamental facts of surface geology as illustrated in Maine are set forth with considerable fullness (chapters I, II, and III). The operative agencies are discussed in close connection with the phenomena described. This is followed by a general description of the systems of glacial gravels (chapters IV, and V). By systems is to be understood

those connected series of gravel ridges that are interpreted as the products of individual drainage systems of the ice sheet, the products of each river system being a gravel system. Some forty odd systems of this kind are recognized besides several less defined series and numerous branches and individual eskers, making on the whole a most phenomenal record of glacial drainage. The description of these occupies 170 pages.

The classification of the gravels and associated deposits and a discussion of their genesis follows and constitutes essentially the remainder of the volume (chapters v and vi, 224 pages). The discussion of the genetic element is elaborate and detailed. Something of the range of special subjects may be gathered from the following special themes: Quantity of englacial débris; distinction between englacial and subglacial tills; the origin of drumlins; the relations of the marine gravels; boulder fields and boulder trains; single or multiple glaciation in Maine; the relation of the glacial waters to the glacial sediments; the sizes of the glacial rivers of Maine; the zones of the Maine ice sheet; englacial streams; the directions of subglacial and englacial streams under existing glaciers; the internal temperatures of ice sheets; the basal waters of ice sheets; basal furrows as stream tunnels; the genesis and maintenance of subglacial and englacial channels; the forms of glacial channels; extraordinary enlargements of glacial river channels; the directions of glacial rivers compared with the flow of ice; the relations of glacial rivers to the relief forms of the land; sedimentation in places favorable or unfavorable to the formation of crevasses; glacial potholes; the formation of kames and osars; the boulders of the glacial gravels; comparative studies on the glaciation of the Rocky Mountains and on the glaciers of Alaska; the modification of the glacial gravels by the sea; the short isolated osars or eskers; the hillside osars or eskers; the isolated kames or eskers ending in marine deltas; isolated osar-mounds not ending in marine deltas; the disconnected osars; the relations of glacial gravels to the fossiliferous marine beds; retreatal phenomena of the ice; causes of non-continuous sedimentation within the ice channels; the continuous osars and their comparison with discontinuous osars; were osars formed by subglacial or superglacial streams? tests of subglacial and superglacial depositions; special features and their explanation.

The illustrations are numerous and add greatly to the value of the text, and the large list of maps set forth the remarkable distribution of the gravel systems.

The work is characterized by enthusiasm and a pervasive desire to explain in fullness and detail all of the phenomena presented. The observational and the rational go hand in hand and each lends interest to the other.

T. C. C.

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*Lower Cambrian Terrane in the Atlantic Province.* By C. D. WALCOTT, Proceedings of the Washington Academy of Sciences. Vol. I, pp. 301-339. February 14, 1900.

The object of the paper, as stated by the author, is to show the stratigraphic relations and successions of the Cambrian faunas of the Atlantic province. In the author's correlation paper on the Cambrian (Bull. 81, U. S. Geol. Surv. 1891), reference is made to unsolved problems of the Cambrian of this province. Mr. G. F. Matthew's study of these problems has led him to conclusions not in accord with those tentatively set forward by Mr. Walcott. He finds the Etcheminian beds at Hanford Brook unconformably below the Protolenus zone and regards them as a pre-Cambrian Paleozoic terrane, and makes a twofold division of the Cambrian of the Atlantic province as follows:

Upper Cambrian, - - -	{ Dictyonema fauna.
	{ Peltura fauna.
	{ Olenus fauna.
Lower Cambrian, - - -	{ Paradoxides fauna.
	{ Newfoundland species described.
	{ Protolenus fauna.

Mr. Walcott, having made a careful study of the Hanford Brook and other localities cited by Mr. Matthew in support of his position, notes the absence of Etcheminian débris in the overlying St. John quartzite, the absence of an irregularly eroded surface on the Etcheminian beds, and the evidence of overlap of these beds on the subjacent Algonkian, and holds that the patchiness and variation in thickness of the Etcheminian may be the result of deposition of sediments upon a very irregular sea-bottom, and not of erosion as held by Mr. Matthew. Mr. Walcott believes the distinctive features of the Etcheminian fauna pointed out by Mr. Matthew do not necessarily separate it from the